

Section 8.4 Solutions

Section 8.4: Matrix Algebra

Use the following matrices to answer all the problems in this section.

$$A = \begin{bmatrix} -2 & 4 \\ 3 & 1 \end{bmatrix}$$

$$B = \begin{bmatrix} 4 & 5 \\ 1 & 2 \end{bmatrix}$$

$$C = \begin{bmatrix} 1 & 0 & -1 \\ 7 & 2 & 4 \\ 2 & 3 & -5 \end{bmatrix}$$

$$D = \begin{bmatrix} 3 & 2 & 0 \\ 4 & -1 & 3 \\ 1 & -5 & 6 \end{bmatrix}$$

$$E = \begin{bmatrix} -3 & 2 & 2 \\ 5 & -1 & 3 \end{bmatrix}$$

$$F = \begin{bmatrix} 1 & -2 \\ 5 & 2 \\ 6 & 7 \end{bmatrix}$$

Perform the indicated operation

1) $3A$

$$3A = 3 \begin{bmatrix} -2 & 4 \\ 3 & 1 \end{bmatrix} = \boxed{\begin{matrix} \text{ANSWER} \\ \begin{bmatrix} -6 & 12 \\ 9 & 3 \end{bmatrix} \end{matrix}}$$

3) $-2F$

$$-2F = -2 \begin{bmatrix} 1 & -2 \\ 5 & 2 \\ 6 & 7 \end{bmatrix} = \begin{bmatrix} -2 & 4 \\ -10 & -4 \\ -12 & -14 \end{bmatrix}$$

$$A = \begin{bmatrix} -2 & 4 \\ 3 & 1 \end{bmatrix}$$

$$B = \begin{bmatrix} 4 & 5 \\ 1 & 2 \end{bmatrix}$$

$$C = \begin{bmatrix} 1 & 0 & -1 \\ 7 & 2 & 4 \\ 2 & 3 & -5 \end{bmatrix}$$

$$D = \begin{bmatrix} 3 & 2 & 0 \\ 4 & -1 & 3 \\ 1 & -5 & 6 \end{bmatrix}$$

$$E = \begin{bmatrix} -3 & 2 & 2 \\ 5 & -1 & 3 \end{bmatrix}$$

$$F = \begin{bmatrix} 1 & -2 \\ 5 & 2 \\ 6 & 7 \end{bmatrix}$$

5) A+B

$$A+B = \begin{bmatrix} -2 & 4 \\ 3 & 1 \end{bmatrix} + \begin{bmatrix} 4 & 5 \\ 1 & 2 \end{bmatrix} = \begin{bmatrix} -2+4 & 4+5 \\ 3+1 & 1+2 \end{bmatrix}$$

$$\boxed{\text{ANSWER}} \\ \begin{bmatrix} 2 & 9 \\ 4 & 3 \end{bmatrix}$$

7) 2A+3B

$$2A+3B = 2 \begin{bmatrix} -2 & 4 \\ 3 & 1 \end{bmatrix} + 3 \begin{bmatrix} 4 & 5 \\ 1 & 2 \end{bmatrix}$$

$$= \begin{bmatrix} -4 & 8 \\ 6 & 2 \end{bmatrix} + \begin{bmatrix} 12 & 15 \\ 3 & 6 \end{bmatrix}$$

$$= \begin{bmatrix} -4+12 & 8+15 \\ 6+3 & 2+6 \end{bmatrix} =$$

$$\boxed{\text{ANSWER}} \\ \begin{bmatrix} 8 & 23 \\ 9 & 8 \end{bmatrix}$$

$$A = \begin{bmatrix} -2 & 4 \\ 3 & 1 \end{bmatrix}$$

$$B = \begin{bmatrix} 4 & 5 \\ 1 & 2 \end{bmatrix}$$

$$C = \begin{bmatrix} 1 & 0 & -1 \\ 7 & 2 & 4 \\ 2 & 3 & -5 \end{bmatrix}$$

$$D = \begin{bmatrix} 3 & 2 & 0 \\ 4 & -1 & 3 \\ 1 & -5 & 6 \end{bmatrix}$$

$$E = \begin{bmatrix} -3 & 2 & 2 \\ 5 & -1 & 3 \end{bmatrix}$$

$$F = \begin{bmatrix} 1 & -2 \\ 5 & 2 \\ 6 & 7 \end{bmatrix}$$

9) $3A - 2B$

$$= 3 \begin{bmatrix} -2 & 4 \\ 3 & 1 \end{bmatrix} - 2 \begin{bmatrix} 4 & 5 \\ 1 & 2 \end{bmatrix}$$

$$= \begin{bmatrix} -6 & 12 \\ 9 & 3 \end{bmatrix} - \begin{bmatrix} 8 & 10 \\ 2 & 4 \end{bmatrix}$$

$$= \begin{bmatrix} -6-8 & 12-10 \\ 9-2 & 3-4 \end{bmatrix} =$$

$$\boxed{\text{ANSWER} \\ \begin{bmatrix} -14 & 2 \\ 7 & -1 \end{bmatrix}}$$

11) $A + C$

$$\begin{bmatrix} -2 & 4 \\ 3 & 1 \end{bmatrix} + \begin{bmatrix} 1 & 0 & -1 \\ 7 & 2 & 4 \\ 2 & 3 & -5 \end{bmatrix}$$

$$\boxed{\text{ANSWER} \\ \text{NOT POSSIBLE}}$$

$$A = \begin{bmatrix} -2 & 4 \\ 3 & 1 \end{bmatrix}$$

$$B = \begin{bmatrix} 4 & 5 \\ 1 & 2 \end{bmatrix}$$

$$C = \begin{bmatrix} 1 & 0 & -1 \\ 7 & 2 & 4 \\ 2 & 3 & -5 \end{bmatrix}$$

$$D = \begin{bmatrix} 3 & 2 & 0 \\ 4 & -1 & 3 \\ 1 & -5 & 6 \end{bmatrix}$$

$$E = \begin{bmatrix} -3 & 2 & 2 \\ 5 & -1 & 3 \end{bmatrix}$$

$$F = \begin{bmatrix} 1 & -2 \\ 5 & 2 \\ 6 & 7 \end{bmatrix}$$

13) D + E

$$\begin{bmatrix} 3 & 2 & 0 \\ 4 & -1 & 3 \\ 1 & -5 & 6 \end{bmatrix} + \begin{bmatrix} -3 & 2 & 2 \\ 5 & -1 & 3 \end{bmatrix}$$

ANSWER
NOT POSSIBLE

15) AB

$$\begin{bmatrix} -2 & 4 \\ 3 & 1 \end{bmatrix} \begin{bmatrix} 4 & 5 \\ 1 & 2 \end{bmatrix}$$

Top Row

$$\begin{array}{r} -2 \cdot 4 = -8 \\ 4 \cdot 1 = 4 \\ \hline -4 \end{array} \quad \begin{array}{r} -2 \cdot 5 = -10 \\ 4 \cdot 2 = 8 \\ \hline -2 \end{array}$$

TOP ROW

Bottom Row

$$\begin{array}{r} 3 \cdot 4 = 12 \\ 1 \cdot 1 = 1 \\ \hline 13 \end{array} \quad \begin{array}{r} 3 \cdot 5 = 15 \\ 1 \cdot 2 = 2 \\ \hline 17 \end{array}$$

BOTTOM ROW

ANSWER

$$\begin{bmatrix} -4 & -2 \\ 13 & 17 \end{bmatrix}$$

$$A = \begin{bmatrix} -2 & 4 \\ 3 & 1 \end{bmatrix}$$

$$B = \begin{bmatrix} 4 & 5 \\ 1 & 2 \end{bmatrix}$$

$$C = \begin{bmatrix} 1 & 0 & -1 \\ 7 & 2 & 4 \\ 2 & 3 & -5 \end{bmatrix}$$

$$D = \begin{bmatrix} 3 & 2 & 0 \\ 4 & -1 & 3 \\ 1 & -5 & 6 \end{bmatrix}$$

$$E = \begin{bmatrix} -3 & 2 & 2 \\ 5 & -1 & 3 \end{bmatrix}$$

$$F = \begin{bmatrix} 1 & -2 \\ 5 & 2 \\ 6 & 7 \end{bmatrix}$$

17) FA $\begin{bmatrix} 1 & -2 \\ 5 & 2 \\ 6 & 7 \end{bmatrix} \begin{bmatrix} -2 & 4 \\ 3 & 1 \end{bmatrix}$

Top Row $-2 \cdot \frac{-2}{3} = \frac{-2}{3}$ $-2 \cdot \frac{4}{1} = \frac{4}{1}$
Top Row $\begin{bmatrix} -8 & 2 \end{bmatrix}$

Middle Row $5 \cdot \frac{-2}{3} = \frac{-10}{3}$ $5 \cdot \frac{4}{1} = \frac{20}{1}$
Middle Row $\begin{bmatrix} -4 & 22 \end{bmatrix}$

Bottom Row $6 \cdot \frac{-2}{3} = \frac{-12}{3}$ $6 \cdot \frac{4}{1} = \frac{24}{1}$
Bottom Row $\begin{bmatrix} 9 & 31 \end{bmatrix}$

ANSWER $\begin{bmatrix} -8 & 2 \\ -4 & 22 \\ 9 & 31 \end{bmatrix}$

19) CD

$$\begin{bmatrix} 1 & 0 & -1 \\ 7 & 2 & 4 \\ 2 & 3 & -5 \end{bmatrix} \begin{bmatrix} 3 & 2 & 0 \\ 4 & -1 & 3 \\ 1 & -5 & 6 \end{bmatrix}$$

Top Row

$$\begin{array}{r} 1 \quad 3 \quad 3 \\ 0 \cdot 4 = 0 \\ -1 \quad 1 \quad -1 \\ \hline 2 \qquad \qquad 7 \qquad \qquad -6 \end{array}$$

Top Row

Middle Row

$$\begin{array}{r} 7 \quad 3 \quad 21 \\ 2 \cdot 4 = 8 \\ 4 \quad 1 \quad 4 \\ \hline 33 \end{array} \quad \begin{array}{r} 7 \quad 2 \quad 14 \\ 2 \cdot -1 = -2 \\ 4 \quad -5 \quad -20 \\ \hline -8 \end{array} \quad \begin{array}{r} 7 \quad 0 \quad 0 \\ 2 \cdot 3 = 6 \\ 4 \quad 6 \quad 24 \\ \hline 30 \end{array}$$

Middle Row

Bottom Row

$$\begin{array}{r} 2 \quad 3 \quad 6 \\ 3 \cdot 4 = 12 \\ -5 \quad 1 \quad -5 \\ \hline 13 \end{array} \quad \begin{array}{r} 2 \quad 2 \quad 4 \\ 3 \cdot -1 = -3 \\ -5 \quad -5 \quad -25 \\ \hline 26 \end{array} \quad \begin{array}{r} 2 \quad 0 \quad 0 \\ 3 \cdot 3 = 9 \\ -5 \quad 6 \quad -30 \\ \hline -21 \end{array}$$

Bottom Row

ANSWER

$$\begin{bmatrix} 2 & 7 & -6 \\ 33 & -8 & 30 \\ 13 & 26 & -21 \end{bmatrix}$$

$$A = \begin{bmatrix} -2 & 4 \\ 3 & 1 \end{bmatrix}$$

$$B = \begin{bmatrix} 4 & 5 \\ 1 & 2 \end{bmatrix}$$

$$C = \begin{bmatrix} 1 & 0 & -1 \\ 7 & 2 & 4 \\ 2 & 3 & -5 \end{bmatrix}$$

$$D = \begin{bmatrix} 3 & 2 & 0 \\ 4 & -1 & 3 \\ 1 & -5 & 6 \end{bmatrix}$$

$$E = \begin{bmatrix} -3 & 2 & 2 \\ 5 & -1 & 3 \end{bmatrix}$$

$$F = \begin{bmatrix} 1 & -2 \\ 5 & 2 \\ 6 & 7 \end{bmatrix}$$

21) BC

$$\begin{bmatrix} 4 & 5 \\ 1 & 2 \end{bmatrix} \begin{bmatrix} 1 & 0 & -1 \\ 7 & 2 & 4 \\ 2 & 3 & -5 \end{bmatrix}$$

Top Row

Doesn't work

$$\begin{array}{ccc} 4 & 1 & 4 & 0 & 4 & 7 \\ 5 & 7 & 5 & 2 & 5 & 4 \\ & 2 & & 3 & & -5 \end{array}$$

ANSWER

NOT possible

23) FE

$$\begin{bmatrix} 1 & -2 \\ 5 & 2 \\ 6 & 7 \end{bmatrix} \begin{bmatrix} -3 & 2 & 2 \\ 5 & -1 & 3 \end{bmatrix}$$

Top Row

$$\begin{array}{r} 1 \cdot -3 = -3 \\ -2 \cdot 5 = -10 \\ \hline -13 \end{array} \quad \begin{array}{r} 1 \cdot 2 = 2 \\ -2 \cdot -1 = 2 \\ \hline 4 \end{array} \quad \begin{array}{r} 1 \cdot 2 = 2 \\ -2 \cdot 3 = -6 \\ \hline -4 \end{array}$$

TOP ROW

Middle Row

$$\begin{array}{r} 5 \cdot -3 = -15 \\ 2 \cdot 5 = 10 \\ \hline -5 \end{array} \quad \begin{array}{r} 5 \cdot 2 = 10 \\ 2 \cdot -1 = -2 \\ \hline 8 \end{array} \quad \begin{array}{r} 5 \cdot 2 = 10 \\ 2 \cdot 3 = 6 \\ \hline 16 \end{array}$$

Middle Row

Bottom Row

$$\begin{array}{r} 6 \cdot -3 = -18 \\ 7 \cdot 5 = 35 \\ \hline 17 \end{array} \quad \begin{array}{r} 6 \cdot 2 = 12 \\ 7 \cdot -1 = -7 \\ \hline 5 \end{array} \quad \begin{array}{r} 6 \cdot 2 = 12 \\ 7 \cdot 3 = 21 \\ \hline 33 \end{array}$$

Bottom Row

ANSWER

$$\begin{bmatrix} -13 & 4 & -4 \\ -5 & 8 & 16 \\ 17 & 5 & 33 \end{bmatrix}$$